



Another new forest-dwelling frog (Leptodactylidae: *Eleutherodactylus*) from the Cockpit Country of Jamaica

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Abstract. A new, diminutive species of *Eleutherodactylus* is described from the mesic forests of the Cockpit Country, Trelawny Parish, west-central Jamaica. The new species is placed in the *gossei* group (sensu Crombie 1977) and is distinguished from other members of this assemblage by its small size, bright yellow belly in life, smooth dorsum, and a variety of other morphological characters. The species is compared with similar Jamaican congeners and data are presented on its natural history, variation, and possible relationships.

INTRODUCTION

In 1938 the late George S. Myers commented that, "... it would seem that one of the chief diversions of contemporary American herpetologists is the describing of new West Indian *Eleutherodactyli*! If I am not believed, I would refer my questioner to Dr. Barbour's recent list (1935)" (Myers 1938:355). Barbour listed 60 species of *Eleutherodactylus* in his 1935 West Indian checklist. Forty years later, despite the synonymization of several of the taxa Barbour mentioned, the total had more than doubled (Schwartz and Thomas 1975, Schwartz et al. 1978). With apologies to Dr. Myers, I herein contribute another, albeit quite distinctive, new species from Jamaica. I also suggest that the situation in South America, where nearly 100 new species have been described since 1968 (27 in 1980 alone), would have horrified Dr. Myers even more.

In the past twelve years of field work in the Cockpit Country of west-central Jamaica, I have been fortunate to catch a glimpse of what much of the West Indian wet forests must have been like before the arrival of humans. The brutal, unforgiving terrain of the Cockpits has largely prevented the wholesale habitat destruction that has modified the distribution and abundance of many Jamaican animals. The result is a unique pocket of relatively undisturbed forest that supports a number of endemic taxa and acts as a refuge for species that could not adapt to the cane fields, rolling pasture, and patchy scrub forest that now characterize much of the island. Sadly, even the Cockpits have recently been under considerable pressure to accommodate the burgeoning population of Jamaica, and modification of the forests has intensified in the past five years.

In describing *Eleutherodactylus sisypodemus* from the deep forests of the Cockpits (Crombie 1977), I compared the new taxon with an equally small, yellow-bellied, syntopic species that I believed was *E. luteolus* (Gosse). Additional field work and an examination of Goin's (1953) material at the Carnegie Museum revealed that *E. luteolus* and the yellow-bellied frog were not conspecific.

As pointed out by Schwartz and Fowler (1973:122–124), *Eleutherodactylus luteolus* is a small to medium-sized species (males to 17.3 mm SVL, females to 25.8 mm SVL) that usually lacks bright ventral or inguinal coloration, has a prominent dark facial mask, and has distinct supra-axillary and inguinal glands; the latter character Goin

(1953) neglected to mention in his redescription of the species. *Eleutherodactylus luteolus* is found in a variety of open, disturbed habitats, including pastures, roadsides and even beaches (Goin 1953, Crombie, *personal observation*). Prior to 1977 I had collected only a few *E. luteolus* in such habitats in Hanover Parish and, on casual examination, considered them identical to the yellow-bellied Cockpit frog, despite the great discrepancy in habitat. In 1978, I collected specimens of a moderate-sized, drab frog with prominent supra-axillary and inguinal glands from road cuts, rock walls and in gardens near the town of Quick Step on the southern edge of the Cockpits. I tentatively regarded them as a new species since they differed so strikingly from similarly sized Jamaican *Eleutherodactylus*. However, in examining Goin's material of *E. luteolus* at the Carnegie Museum, I found that females were very much larger and stockier than males and that even poorly preserved specimens had indications of glands. Reexamination of my specimens from the Quick Step road revealed that they were indeed large female *E. luteolus* and that the yellow-bellied species from the forest was distinct and undescribed. References to *Eleutherodactylus luteolus* in my 1977 paper refer to the new species.

Eleutherodactylus griphus, sp. nov.

Holotype.—National Museum of Natural History (USNM) 250000, a gravid female from the vicinity of "the cave," about 7 mi (11.2 km) WNW Quick Step, Trelawny Parish, Jamaica, ca. 250 m elevation, collected by L. Richard Franz and R. I. Crombie on 8 April 1978.

Paratopotypes (59).—USNM 250033–48, same data as holotype; San Diego Society of Natural History (SDSNH) 64197–99, 64201, USNM 244472–73, collected by Gregory K. Pregill, R. I. Crombie and Linda K. Gordon on 11 June 1983; USNM 244469–71, collected by G. K. Pregill, R. I. Crombie and L. K. Gordon on 10 June 1983; USNM 250005–11, Carnegie Museum of Natural History (CM) 112377–78, Museum of Comparative Zoology, Harvard University (MCZ) 107864–65, Albert Schwartz Field Series (ASFS) V36384–85, collected by R. I. Crombie, Jeremy F. Jacobs and Barbara A. Harvey on 12 July 1975; USNM 250012–32, collected by R. I. Crombie, Frances I. McCullough, J. F. Jacobs and Menocal Stephenson on 15 July 1977.

Additional paratypes (4).—USNM 250001–04, from 0.5–1.0 mi (0.8–1.6 km) N of Quick Step, ca. 350 m, Trelawny Parish, Jamaica, collected by R. I. Crombie, F. I. McCullough, J. F. Jacobs and M. Stephenson on 14 July 1977.

Referred specimens.—USNM 244607 (dry skeleton) collected at the type locality by G. K. Pregill, L. K. Gordon, William B. Hilgartner and Richard Thomas, 16 June 1983; USNM 244627 (cleared and stained), same locality, collected by G. K. Pregill, L. K. Gordon and R. I. Crombie on 11 June 1983.

Diagnosis.—A small species (males to 14.2, females to 18.4 mm SVL) distinguished from all other Jamaican *Eleutherodactylus* by the following combination of characters: prominent dark canthal bars or facial mask and dark lateral stripes extending to near midbody, belly metallic yellow in life with no red or orange in groin or on concealed parts of legs, throat with distinct dark spots or extensive marbling, smooth dorsal skin with no scapular "W," no inguinal or supra-axillary glands, no tarsal fringe or calcar, no toe webbing.

Description of holotype.—A gravid female with the following measurements (in mm): snout vent length (SVL) 16.4; head length (HL) 6.9; head width (HW) 6.9; tympanum diameter (TYM) 1.0; eye diameter (EYE) 2.6; naris-eye distance (NE) 1.9; femur length (FEM) 8.5; tibia length (TIB) 8.0; foot length (FT) 8.0. Head as long as broad; HW/SVL 42%. Snout rounded in dorsal and lateral view, canthus rostralis rounded; loreal region obtuse; lips not flared. Nostrils lateral, much closer to tip of snout than eye; eye diameter greater than distance from naris to eye, interorbital distance 2.2, less than eye diameter. A single indistinct tubercle on each upper eyelid. Tympanum distinct, round, proportionally larger in males. Tongue lanceolate, slightly nicked behind, free posteriorly for more than half its length. Choanae moderate-sized, elliptical; prevomerine dentigerous processes in two long, arched series from level of outer choanal

border, almost meeting on palatal midline; separated by a distance of less than half a choanal diameter. Fingers moderately long, unwebbed, III longest, IV, II, and I subequal. Digital pads flattened, longer than wide, pointed (particularly III and IV), with circumferential grooves. Two flattened palmar tubercles; two indistinct conical tubercles between palmar tubercle and basal subarticular tubercle on finger IV; no ulnar or supernumerary tubercles. Toes long, unwebbed; IV, III, II, V, I in order of decreasing length; a pale, flattened inner metatarsal tubercle and a conical outer one; digital pads similar to those on fingers but slightly larger and more pointed. Heels touch when femora at right angles to body axis; TIB/SVL 49%. Vent directed posteriorly with an indistinct dark line above it. Skin of dorsum smooth with a few low, pale tubercles on hind limbs. Venter smooth, becoming faintly granular on thighs and near vent.

Coloration of holotype.—In life, the dark chocolate brown dorsal stripes, more intense toward the snout where they meet, broke up at midbody and disappeared near the inguinal area. The middorsal area was lighter wood brown with an indistinct pale middorsal hairline beginning just above the vent and ending in the scapular area. The light dorsolateral stripes were tan, becoming silvery on upper eyelid and continuing to where they meet on the tip of the snout. The loreal area was medium brown with a darker spot at the anterior corner of each eye. A black lateral line started at the eye and continued over the tympanum to midbody, where it broke up into a series of spots, and ended. The legs were medium brown above, the thighs faintly and irregularly barred with darker brown. The posterior thighs were light brown with no bright colors on concealed surfaces or in groin. There was one dark brown blotch on the dorsolateral right forearm, two on the left, and a similar one on the anterior face of each humerus. The entire venter was uniform pale metallic yellow with a vague dusky suffusion on the throat. The iris was gold above and red-brown below.

Morphological variation.—Nineteen adult females (including the holotype) have the following measurements (in mm) and proportions: SVL 15.5–18.4 ($\bar{x} = 17.0 \pm 0.80$), HL 6.1–7.3 (6.9 ± 0.30), HW 6.4–7.6 (7.0 ± 0.32), TYM 1.0–1.3 (1.1 ± 0.11), EYE 2.1–2.8 (2.5 ± 0.16), NE 1.7–2.3 (2.0 ± 0.13), FEM 7.7–8.9 (8.3 ± 0.35), TIB 7.4–8.5 (8.1 ± 0.29), FT 7.0–8.5 (7.9 ± 0.45), HW/SVL 39–42% (41 ± 0.74), TIB/SVL 45–51% (47 ± 1.45).

Thirty two adult males have the following measurements and proportions: SVL 9.4–14.2 (12.5 ± 2.48), HL 3.9–6.0 (5.4 ± 0.42), HW 3.6–5.9 (5.3 ± 0.45), TYM 0.8–1.3 (1.1 ± 0.25), EYE 1.6–2.2 (2.0 ± 0.14), NE 1.0–1.8 (1.5 ± 0.18), FEM 4.6–7.7 (6.2 ± 1.25), TIB 4.7–7.0 (6.3 ± 0.41), FT 4.0–6.6 (5.8 ± 1.16), HW/SVL 38–44% (40 ± 7.4), TIB/SVL 44–53% (49 ± 1.89).

Morphological variation in the sample is comparatively slight, with a few exceptions. Eyelid tubercles may be almost indistinguishable (as in the holotype) or prominent (USNM 250043). Digital discs may be distinctly pointed or rounded, and the heels may barely meet or may overlap considerably (see TIB/SVL ratios above). The head varies from slightly longer than broad to broader than long in both sexes.

In contrast, both dorsal and ventral patterns are extremely variable. The dark spots on the forelimbs, body, and above the anus, and the hindlimb barring may be distinct, absent, or any condition in between. In the tricolor morph (see below), the dark dorsal stripes may be present only in the postocular area, extend to the inguinal area (Fig. 2A), or break up near midbody as in the holotype. The middorsal hairline, when present, is usually confined to the posterior body but it can (rarely) extend onto the posterior thighs; one individual (USNM 250039) even had hairlines on the posterior tarsi. The pale spots and/or tubercles on the hindlimbs (see Fig. 1) are not visible in life but appear after preservation in some individuals.

The ventral color is invariably yellow, often almost metallic. The dark pigmentation on the throat is quite variable, and may consist of obscure marbling or stippling, discrete dark blotches restricted to the edges of the mandible, or a general gray suffusion extending to the pectoral area. Some individuals have distinct gray spots on the throat, similar to the characteristic pattern of *E. grabhami*. The extreme condition is found in the single juvenile (USNM 250007) in which the entire belly is marbled with gray.

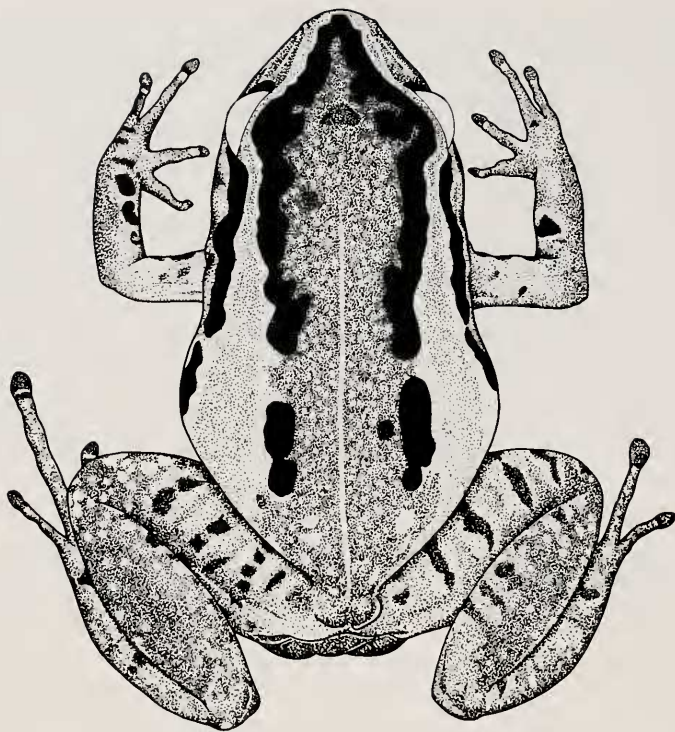


FIGURE 1. Dorsal view of the holotype of *Eleutherodactylus griphus* (USNM 250000). SVL 16.4 mm.

Pattern polymorphism.—Pattern variation in frogs of the genus *Eleutherodactylus* can be extreme and this has led to considerable taxonomic confusion (Lynch 1966). Jamaican frogs of the *gossei* group may have as many as 9 morphs in a single species (Goin 1954:193, fig. 2 and data presented below). Goin (1950, 1954) attempted to quantify this variation and standardize terminology for the various morphs. I previously discussed polymorphism in some members of the groups and suggested some changes in Goin's arrangement and terminology (Crombie 1977:198–199).

Compared to other members of the *gossei* group, polymorphism in *E. griphus* is conservative (see Fig. 2), but some individuals may have a combination of two or three pattern elements regarded as distinct morphs by Goin (see below).

The holotype and 14 other specimens of *Eleutherodactylus griphus* have light dorsolateral stripes (Figs. 1, 2A) that start on the tip of the snout, continue across the eyelids and onto the lateral body, becoming much wider posteriorly (see coloration of the holotype for more complete description of this morph). This is not the dorsolateral stripe morph of Goin (1950, 1954), which consists of stripes that are more dorsal than lateral and approximately the same width anteriorly and posteriorly (see Lynn 1940, Pl. VI, fig. 11c). Although Goin (1954) did not recognize these differently striped frogs as a distinct morph, Lynn (1940) illustrated a similar pattern for both *E. gossei*, which he incorrectly called *luteolus* (Pl. IV, fig. 7d), and *E. orcutti* (Pl. XII, fig. 23b). This is one of the most distinctive, albeit uncommon morphs in the *gossei* group and, for convenience, I propose to call it the “tricolor” morph, in allusion to the pale dorsolateral stripes, the dark outlining, and the less intensely dark middorsal area.

The second morph of *Eleutherodactylus griphus* apparently does not occur in other members of the *gossei* group and I have called it “plain” (Fig. 2B). It consists of a basically unicolor dorsum, with or without a dark interocular bar. Roughly 50% of the present sample is this morph.

The third morph was termed “purple” by Goin (1954:191) and was illustrated by Lynn (1940, Pl. IV, fig. 7f). A few specimens of *E. griphus* compare well with the

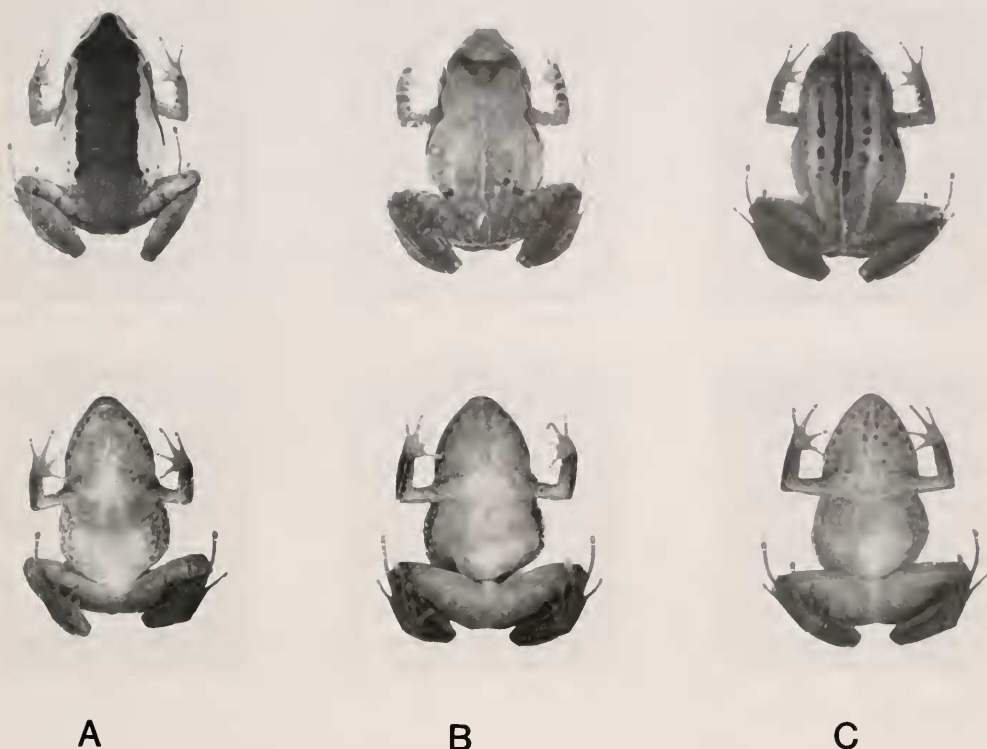


FIGURE 2. Dorsal and ventral view of the three commonest morphs of *Eleutherodactylus griffiths*: A) tricolor, USNM 244471; B) plain, USNM 250041; C) purple, USNM 250038.

description of this morph (Fig. 2C), previously found only in *E. gossei* (Goin 1954:191), but my collections document its presence in *E. pentasyringos* also (USNM 250949 and 250971).

Five (mottled, broad dorsolateral stripe, broad middorsal stripe, interocular bar, picket) of the seven other morphs in the *gossei* group are unknown in *E. griffiths*. Although a dark interocular bar is common in the plain morph and may be faintly indicated in some tricolor frogs, it is different from Goin's interocular bar morph, which consists of a light bar, outlined with black. Pelvic spots, which I prefer to call lumbar spots (Crombie 1977:199), occasionally occur in the plain morph of *E. griffiths*. The middorsal stripe (=middorsal hairline) may also be indistinctly visible in both tricolor and plain morphs but it is restricted to the posterior body, never extending to the snout and rarely onto the thighs as it does in other members of the *gossei* group.

Comparisons.—*Eleutherodactylus griffiths* is only slightly larger than the smallest known Jamaican frog, *E. sisypodemus* (males to 13.8, females to 17.9 mm SVL), with which it is syntopic in the Cockpit forests. However, as with many members of the genus, absolute morphological differences between *E. griffiths* and sympatric congeners may not exist. Accurate identification may often depend on coloration in life, advertisement call, distribution, habitat, and other non-morphological characters that are difficult or impossible to assess in older museum specimens. Perhaps the best example in Jamaica is *E. junori*, a small (19–27 mm SVL) species with a distinctive, loud, ratchet-like call, but otherwise indistinguishable from the slightly larger *E. gossei*. In the following discussion I have attempted to use distinguishing characters that do not depend on familiarity with the species in life whenever possible, but in some cases size and/or distribution must be used.

I have previously (Crombie 1977:200) discussed the species groups of Jamaican *Eleutherodactylus*. Although there are conflicting data on this arrangement (see Rela-

tionships), it remains a convenient tool for making pertinent comparisons. Since *E. griphus* is clearly a member of the *gossei* group as previously defined (Crombie 1977), distinguishing it from the members of the very different *auriculatus*, *jamaicensis* or *ricordii* groups, with the exception of *E. grabhami* (see below) is unnecessary.

The eastern endemics of the *gossei* group from the granitic Blue Mountains (*E. alticola*, *E. andrewsi*, *E. nubicola*, *E. orcutti*, and *E. pentasyringos*) are distributionally far removed from the range of *E. griphus*. Most are much larger frogs that occur above 2500 feet (810 m) in the mountains. The smallest of them, *E. andrewsi* (18–23 mm SVL), usually has a pale dorsum with distinct dark inguinal spots, a venter heavily pigmented with dark spots or a reticulum, and red flash colors in the inguinal areas and concealed thighs. *Eleutherodactylus orcutti* is a stream- or seep-inhabiting species with conspicuous basal toe webbing and a tuberculate dorsum; *E. nubicola* has poorly developed digital discs and a uniform gray belly, even in preservative; *E. alticola* is restricted to the highest peaks of the Blue Mountains, has very short vomerine series and red groin patches. I regard *E. pentasyringos* as a distinct species rather than a subspecies of *E. pantoni*. Schwartz and Fowler (1973:118) suggested that the two might not be conspecific and my unpublished data confirm the morphological and acoustic differences between the two taxa. Although *E. pentasyringos* occurs in the lowlands north of the Blue Mountains and often has a pale yellow belly like *E. griphus*, it is a larger, more robust species with a loud six-note call.

The most pertinent comparisons are with the six species of the *gossei* group with which *E. griphus* is actually or potentially sympatric and *E. grabhami*, a small sympatric member of the *ricordii* group. I previously (Crombie 1977:200) compared *E. sisypodemus* with *E. griphus* (which I then called *luteolus*), concluding that the calcar, tarsal fringe, ulnar stripe, and black ventral coloration of *E. sisypodemus* distinguished even recently hatched specimens.

Eleutherodactylus luteolus is generally found in more open areas than *E. griphus* but the two may be syntopic at the forest edge. Males are similarly sized but *E. griphus* is slightly smaller, with dark throat markings, and a bright yellow belly in life. All the *E. luteolus* I have collected have been singularly drab frogs, and I have not seen the reddish dorsal markings or pale yellow bellies mentioned by Schwartz and Fowler (1973:123–124). However, the prominent supra-axillary and inguinal glands of *E. luteolus* are visible even in preserved material and serve to distinguish it from all similar species.

As previously mentioned, the throat markings of *E. griphus* may resemble those of *E. grabhami*, but the similarities end there. *Eleutherodactylus grabhami* is a pale, mottled frog (occasionally with broad dorsolateral light stripes) with fragile dorsal skin, a white belly, and pinkish hindlimbs and brachia. Although *E. grabhami* has been found less than a meter from individuals of *E. griphus* in the Cockpit forest, *E. grabhami* are usually up on limestone rocks as opposed to concealed in the leaf litter. *Eleutherodactylus grabhami* has also been found in terrestrial bromeliads and on low shrubs (Schwartz and Fowler 1973:81; Crombie, *personal observation*), indicating that it is more arboreal than *E. griphus*.

The remaining four species, *E. fuscus*, *E. gossei*, *E. junori*, and *E. pantoni*, are very similar and often difficult to distinguish in the field, although their advertisement calls are very different. Perhaps the most distinctive is *E. fuscus*, which often has a bright yellow venter, orange or reddish in the groin and on the concealed legs, a continuous dark supra- and post-tympanic crescent, and a tubercular scapular “W.” My observations on the coloration of this species agree with those of Schwartz and Fowler (1973:119–120) rather than the original description, in which Lynn and Dent (1942:236) described the venter in life as “immaculate white.” In ventral color, *E. fuscus* and *E. griphus* are similar, but *E. griphus* is a much smaller species (*fuscus* males 25–35, females 31–37 mm SVL), with distinct dark throat markings, canthal stripes and/or a facial mask, no bright colors in the groin or on concealed limbs, and smooth dorsal skin. Although many *E. griphus* may have both supra- and post-tympanic dark spots, they do not form a continuous crescent as in *E. fuscus*. Reportedly, one of the paratypes

of *E. fuscus* (USNM 115978) was collected at Quick Step (Lynn and Dent 1942:235). However, I have never heard the distinctive call of this species in the southern Cockpits, so sympatry with *E. griffus* remains to be demonstrated.

Like *E. fuscus* and *E. griffus*, *E. pantoni* has bright ventral coloration, ranging from yellow to burnt orange. Schwartz and Fowler (1973) recognized three subspecies of this widespread and variable frog, one of which (*pentasyringos*) I regard as a distinct species (see above). The southern Cockpit Country populations are intergradient between *E. p. pantoni* and *E. p. amiantus*. Adults (to 40 mm +) have a prominent raised scapular "W" and cannot be confused with *E. griffus*; even juvenile *E. pantoni* lack dark canthal and lateral body stripes.

As noted above, *E. gossei* and *E. junori* are virtually indistinguishable without information on the call so they will be considered together here. *Eleutherodactylus junori* is the smaller species (19–27 mm SVL vs. 28–34 mm in *gossei*), but both have prominent orange or pink patches in the groin and a raised (often outlined in brown) scapular "W," lacking in *E. griffus*. Some individuals of *E. gossei* may have a pale yellow belly (Schwartz and Fowler 1973:92; Crombie, *personal observation*) but it is usually dull white or ivory. Cockpit Country *E. gossei* also lack the dark canthal stripe or facial mask of *E. griffus* but this pattern may be present in *E. gossei* from localities to the east.

Relationships.—Since studies on the relationships of Jamaican *Eleutherodactylus* based on osteology (Glenn Flores) and electrophoresis (Blair Hedges) are in progress, my speculative comments on the relationships of *E. griffus* will be brief.

Although the preliminary osteological and electrophoretic data are not in agreement on the species groups of Jamaican *Eleutherodactylus* as I defined them (Crombie 1977), *E. griffus* is clearly more closely related to the members of the *gossei* group than to any other West Indian *Eleutherodactylus*. Pending the outcome of other studies, I continue to recognize the *gossei* group as a natural assemblage.

There are two main centers of inter- and intra-specific diversity in the group, both associated with extremely mesic areas that were probably isolated during the drier periods of the Pleistocene (Pregill and Olson 1981). The higher elevations of the eastern Blue Mountains and their windward slopes harbour six endemic taxa of the *gossei* group and the western limestone region contains five, including *E. griffus*. It seems likely that *E. griffus* evolved from the widespread, ecologically versatile *gossei-pantoni* stock in the mesic enclave of the Cockpits.

Natural history.—*Eleutherodactylus griffus* is the commonest leaf litter frog in the Cockpit forest and it has been collected on each of my visits to the area, as compared to *E. sisypodemus* which was found on only two of five occasions. Both species are completely terrestrial and nocturnal but individuals can often be found by day, particularly following afternoon rains. *Eleutherodactylus griffus* appears tolerant of drier conditions and, unlike *E. sisypodemus*, it has been found in open areas (around tree falls) within the forest and on occasions when the leaf litter was less than saturated.

Although *E. griffus* is largely confined to pockets of leaf litter in undisturbed forest, I collected a small series (USNM 250001–04) at the forest edge along the road north of Quick Step in 1977. They were found after dark in leaf litter along rock walls and cliffs, associated with *E. cundalli*, *E. gossei*, *E. grabhami*, *E. luteolus* and *E. pantoni*. Although I suspect that *E. griffus* is a Cockpit endemic, this apparent tolerance of disturbed areas may indicate a wider distribution.

Although nests were not found in the field, 13 (42%) of the female paratypes were gravid and six others had distended, convoluted oviducts, suggesting recent reproductive activity. The smallest of these adult females were 15.5 (convoluted oviducts, small ova) to 15.7 (gravid) mm SVL. Four of the 12 immature females were larger (15.6–16.1 mm SVL) than the smallest adult female. Immature individuals were characterized by thin, straight oviducts and flattened, translucent ovaries with barely recognizable follicles.

The one juvenile (USNM 250007, 6.5 mm SVL) appeared to be a recent hatchling

but a 9.4 mm individual (USNM 250034) had moderately enlarged, rounded, granular testes and was regarded as an adult. All the other males (11.0–14.2 mm SVL) had moderately to greatly enlarged testes and appeared to be reproductively active.

The “soft call of *E. luteolus*” (= *griphus*) I mentioned in my 1977 paper is actually that of *E. sisymphodemus* (Crombie MS). Despite considerable attention given to tracking calls in the leaf litter under favorable conditions on the 1983 trip, no call was heard that was attributable to *E. griphus*.

Gut contents, examined superficially in skeletonized, cleared and stained, and selected preserved specimens, consisted primarily of ants, spiders, and small cockroaches. However, two greatly distended individuals (USNM 250001, 14.2 mm SVL, and USNM 250042, 13.6 mm; both immature females) each contained a lepidopteran larva longer than their own body (18 and 15 mm, respectively). USNM 250001 also contained a few ants and cockroach legs.

The type locality was discussed in some detail previously (Crombie 1977), but the area has changed somewhat since my first visit in 1971. In my 1977 paper I placed “the cave” at about 4 mi (6.4 km) WNW of Quick Step. This was based on a road distance of 2 miles (3.2 km) north of the village of Quick Step, then an estimated two mile overland walk roughly WNW of the road to the cave. Since that time the Quick Step road, formerly a treacherous mud and rock track that was impassible in wet weather, has been altered and improved. It is now paved as far as Quick Step and the unpaved stretch north to the cave trail is considerably smoother and less steep. In 1983, the odometer reading from Quick Step P.O. to the beginning of the cave trail was 4.9 miles (7.8 km), resulting in the type locality (ca. 7 mi WNW Quick Step) as stated in the above description. Despite the slight mileage differences in my previous paper and this, the type localities of *E. griphus* and *E. sisymphodemus* are the same cave. Recent work in the area by cavers has resulted in an excellent map of the cave (called Marta Tick Cave) and a general discussion of the area (Baker et al. 1986).

A botanical survey of the Cockpits by Frank W. Davis (U.C. Santa Barbara) provides an expanded vegetational profile of the type locality. The cave is located on a 20–35° scree slope that is covered with slightly disturbed wet limestone forest (Asprey and Robbins 1953). The forest canopy is at 8–10 m but it is broken by emergents with heights to 33 m. Common tree species include *Nectandra antillana*, *N. patens*, *Guarea schwartzii*, *Ficus* sp., *Calophyllum calaba*, and *Trichilia moschata*. The fairly open shrub layer includes saplings of overstory species as well as *Eugenia* sp., *Psychotria* sp., *Calyptronomum occidentale*, and *Quina jamaicensis*. A sparse herb layer is dominated by the trailing liana *Syngonium auritum*; other common lianas include *Vitis tilliifolia* and *Cissus sycioides*. *Tillandsia antillana* is a common large epiphyte.

Etymology.—A noun in apposition, taken from the Greek “griphos,” used idiomatically to refer to anything chaotic, confusing, or inexplicable. Given the 400+ species in the genus *Eleutherodactylus* and the bewildering variation and pattern polymorphism exhibited by many species, I feel the combination is singularly appropriate. Although this species is not particularly variable compared to other Jamaican *Eleutherodactylus*, the name also commemorates my initial confusion in mistaking *E. griphus* for *E. luteolus*, a thoroughly different species.

ACKNOWLEDGMENTS

Since the discovery of *Eleutherodactylus griphus* is but one segment of a project begun in 1970, I naturally owe a debt of gratitude to a great many people and institutions. I will try to thank these friends and colleagues adequately in future synthetic works but for now I mention only those who actively assisted in the Cockpit work.

During the 1983 trip I benefitted greatly from the expertise and companionship of Frank W. Davis, Linda Gordon, Bill Hilgartner, Dyer Moore, Greg Pregill, Dave Steadman, and Richard Thomas. Frank Davis kindly provided the botanical profile of the type locality. In previous years Dick Franz, Barbara A. Harvey, Frances J. Irish (McCullough), Jeremy F. Jacobs, and Fred G. Thompson all braved the rigors of the Cockpits with me.

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LITERATURE CITED

- Asprey, G. F., and R. G. Robbins. 1953. The vegetation of Jamaica. *Ecological Monographs* 23(4):359-412.
- Baker, Linda L., Edward A. Devine, and Michael A. Di Tonto. 1986. Jamaica. The 1985 expedition of the NSS Jamaica Cockpits Project. *National Speleological Society News* 44(1):4-15.
- Barbour, Thomas. 1935. A second list of Antillean reptiles and amphibians. *Zoologica* 19(3):77-141.
- Crombie, Ronald I. 1977. A new species of the genus *Eleutherodactylus* (Amphibia: Leptodactylidae) from the Cockpit Country of Jamaica. *Proceedings of the Biological Society of Washington* 90(2):194-204.
- Goin, Coleman J. 1950. Color pattern inheritance in some frogs of the genus *Eleutherodactylus*. *Bulletin of the Chicago Academy of Sciences* 9(1):1-15.
- . 1953. Rediscovery of the frog *Litoria luteola* Gosse in Jamaica. *Occasional Papers of the Museum of the Institute of Jamaica* No. 7.
- . 1954. Remarks on the evolution of color pattern in the *gossei* group of the frog genus *Eleutherodactylus*. *Annals of the Carnegie Museum* 33(10):185-195.
- Lynch, John D. 1966. Multiple morphotypy and parallel polymorphism in some neotropical frogs. *Systematic Zoology* 15(1):18-23.
- Lynn, W. Gardner. 1940. I. Amphibians. Pp. 1-60 in W. G. Lynn and C. Grant. *The Herpetology of Jamaica*. *Bulletin of the Institute of Jamaica, Science Series* No. 1.
- , and James N. Dent. 1942. Notes on Jamaican amphibians. *Copeia* (4):234-242.
- Myers, George S. 1938. Fresh-water fishes and West Indian zoogeography. *Annual Report of the Smithsonian Institution for 1937*, pp. 339-364.
- Pregill, Gregory K., and Storrs L. Olson. 1981. Zoogeography of West Indian vertebrates in relation to Pleistocene climatic cycles. *Annual Review of Ecology and Systematics* 12:75-98.
- Schwartz, Albert, and D. C. Fowler. 1973. The anura of Jamaica: a progress report. *Studies on the Fauna of Curacao and other Caribbean Islands* 43(142):50-142.
- , and Richard Thomas. 1975. A check-list of West Indian amphibians and reptiles. *Carnegie Museum of Natural History Special Publication* No. 1.
- , ———, and Lewis D. Ober. 1978. First supplement to a check-list of West Indian amphibians and reptiles. *Carnegie Museum of Natural History Special Publication* No. 5.